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ABSTRACT

This paper suggests some of the implications television producers can find in emerging currents of theoretical research. The effectiveness of television over a wide range of tasks has led in some cases to too much ETV being broadcast and has covered up the fact that television can make a unique contribution to certain tasks and should be used where possible for those. Teacher resistance to ETV can be countered by providing material that teachers themselves cannot provide and by increasing teacher control over content and scheduling. Problems of attention yield to change of pace, use of short segments, active viewer participation, and special attention-directing cues. Since television's code is mainly iconic, ETV can best be used to teach material that depends on that rather than on digital or analogue coding, and to increase students' skill in processing iconic material. The concreteness of television is emerging as a major determinant of its most productive uses, and its unintended effects are proving as worthy as intended effects of a producer's attention. (Author)

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Instructional Learning Skills Television Project

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Background Paper

Some Notes on Research, Theory, and Production in Instructional Television

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

Saul Rockman

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

by
Wilbur Schramm
Distinguished Center Researcher
Communication Institute
The East-West Center
Honolulu

The Essential Learning Skills Television Project is a cooperative activity of state and provincial agencies, designed to strengthen learning skills instruction in American and Canadian elementary schools. It had its origin in a 1973-74 series of meetings of educators and educational broadcasters in the United States and Canada.

Organized and managed by the Agency for Instructional Television, the project is financed largely by the participating states and provinces. Exxon Corporation is supporting initial informational activities; the Corporation for Public Broadcasting has reserved funds to assist production.

The project undertakes to develop television and related printed materials that will enhance the teaching of communication skills, mathematics skills, and reasoning and study skills. This publication is one in a series of background papers prepared to help in the conceptualization of materials for the project.

This document was developed for The Essential Learning Skills Television Project. However, its content does not necessarily reflect the position or policy of the project.

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Some Notes on Research, Theory, and Production in Instructional Television

Abstract

This paper suggests some of the implications television producers can find in emerging currents of theoretical research. The effectiveness of television over a wide range of tasks has led in some cases to too much ETV being broadcast and has covered up the fact that television can make a unique contribution to certain tasks and should be used where possible for those. Teacher resistance to ETV can be countered by providing material that teachers themselves cannot provide and by increasing teacher control over content and scheduling. Problems of attention yield to change of pace, use of short segments, active viewer participation, and special attention-directing cues. Since television's code is mainly iconic, ETV can best be used to teach material that depends on that rather than on digital or analogue coding, and to increase students' skill in processing iconic material. The concreteness of television is emerging as a major determinant of its most productive uses, and its unintended effects are proving as worthy as intended effects of a producer's attention.

Introduction

This paper may demonstrate, regardless of the intent of the author, that theoretical research on instruction by television has not yet reached a stage where it can be of great practical use to producers of educational television programs.

By theoretical research I mean the kind that tests hypotheses in an experimental setting, and accumulates hypotheses into propositions and propositions into theory. By producers I mean the people who are responsible for planning and designing ETV courses and programs and for making the countless specific decisions that determine what is going to happen at 1:46:10, and then at 1:46:16, during the program.

Let me make very clear what I am trying to say about the relationship of theoretical research to producers. I am not doubting the usefulness of *research* to ETV production. Indeed, the less that theoretical research can contribute, the more necessary formative research becomes; and the latter will certainly prove to be an indispensable component of the new Agency for Instructional Television (AIT) series in the essential learning skills.

Nor do I doubt the usefulness of *theory* to ETV production. A good theory is probably the most practical product of science, and if we had an adequate theory of television learning and teaching we could derive an almost endless number of specific guidelines from it.

What I am trying to say is that theoretical research in this field may

not yet have produced enough insights and patterns to be of great practical use to producers. Ideally, of course, we should like to have an understanding of television on the level with Newton's Laws, which make it possible to do an enormous variety of things, from building bridges to sending spaceships to the planets; or the double helix genetic code that is opening the doors to practical medicine and biology of far-reaching significance; or atomic theory, which has made it possible to construct nuclear explosives, reactors, power plants, and a great many other things of potency and practical importance. Unfortunately, we have nothing like that.

This is the case despite the fact that at least 600 papers have been produced on learning from television, and that the United States Department of Health, Education, and Welfare has spent far more on the problem than anyone ever gave Newton for research. But it goes without saying that this is a young field and that it has not yet produced a Newton. A great deal of effort has been wasted on hundreds of fuzzy studies of "can television teach?" or "can it teach as well as a classroom teacher?" Many of the best-supported studies in the field have been designed to find out whether Project X was a success, or whether students in Project Y with television learned more than students in Project Y without it. Such studies were obviously intended to inform or encourage managers and sponsors, rather than producers.

We seem to have had a great deal of trouble getting hold of the essential questions. Probably the most helpful basic question, if we could answer it now, would be the difference between learning from the linear, digital, symbolic patterns of print and the spoken word, and the simultaneous, iconic, observational patterns of the visual media. But of this we have only the most primitive idea.

In other words, we have a research method (formative research) that lets us answer specific questions about specific programs under specific conditions, but a minimum of theory that lets us generalize upon those questions and answers. It is necessary to admit this before inviting you to read any more of this paper. What we are beginning to develop, as we accumulate findings and propositions, are theories of the middle range—limited in generality and applicability, but moving in that direction.

In this paper I am going to try to give you an idea what some of these emerging theories of the middle range are beginning to look like, and to suggest what some of their implications might be for the producer.

1. The Broadband Qualities of Television

An important understanding has emerged from a number of experiments and case studies: how very *wide* the band of television's effectiveness is. Literally hundreds of studies have now shown television used effectively for teaching at every level from preschool to

adult education, for almost every subject in the formal curriculum and a varied collection of extra-curricular subjects, and for almost every learning situation—from school to military, to industrial, to group study out of school, to individual study at home. No other medium has been tested so widely; no other medium except the textbook has been used for so many different purposes.

Where these varied uses of television have been measured, they have almost invariably shown learning gains, often large ones. Where they have been compared with the same subject taught face-to-face by a classroom teacher, the more closely the conditions of the experiment have been controlled, the less likely it has been to find significant differences in learning. All such comparisons lose a certain amount of realism by being squeezed into an experimental design; and when learning from television has been measured, it has usually been an average of many acts of learning over many objectives, spread over an entire course or a unit of a course, and consequently averaging out some tasks that television can do well and some that it cannot. But even though the research results may be flawed, an ETV producer can go forward with considerable confidence in the flexibility and resources of his medium, knowing that other producers have found ways to accomplish with it a great variety of learning-teaching tasks.

But so what? Children learn, or can learn, from any experience, from direct observation or from media. They often learn what it is intended they should learn, and, almost as often, what they are *not* intended to. The richer, the denser the medium, the more likely scholars are to be surprised by *what* is learned from it. Television is perhaps richer and denser than any other instructional medium. But regardless of the medium, researchers are constantly surprised by *how much* children learn from all kinds of experience, especially in their first eight or nine years, and how much they learn that is not measured by any test of knowledge they are likely to be given. Therefore, the fact that children learn a lot from television is of much less interest than what they learn from it as compared to what they learn from other sources.

Unfortunately, this wide band of "learnability" plus television's wide band of flexibility and variety have tended to cover up the fact that television performs some tasks much better than others. Consequently many of the large ETV projects of the 1950's and 1960's have used television as a delivery system rather than a teaching medium. In Samoa, for example, teachers were put in front of a camera to teach the core of a curriculum, with very little attention to what the special contribution of television to the curriculum might be, and what might be done better by other media or in other ways. This kind of strategy has run head-on into teacher resistance, student dissatisfaction, and the growing belief that all teaching should be multi-media.

There has been a sharp veer in the interpretation of the wide-band characteristics of television. In the 1950's the question was "Can television teach?", but the medium has clearly demonstrated its broad usefulness and the question is now "How and what can television teach *best*?" Some have dared to suggest that perhaps *too much* instructional television is being broadcast, and that it is being used for too many things, thus diluting both its general effectiveness and its popularity.

Therefore the lesson to be learned from this emergent theory is somewhat different from the obvious one—that television can teach anything. It is rather that television, used at its best, can teach some things *very well*. It can contribute to teaching in special ways that neither the teacher nor other media can. Our task is, I believe, to refrain from the indiscriminate use of television that has caused the medium trouble for twenty years, concentrate on its unique contributions to a course, and encourage teachers and students to fill in other needed stimuli to learning. Once that decision is made, then the unique flexibility and broadband resources of television take on a different significance. For they offer a producer and writer very wide latitude in carrying out a given task in the very best way he can conceive of doing it. And once the task is determined and the time assigned, the producer can be fairly confident that within television's broad band of capabilities he can stimulate all the learning acts required without asking the teacher to dart back and forth from medium to medium, exercise to exercise, to find the ideal one—as long as his program stays within the priority area of teaching where he has decided that television can make the major contribution.

2. Teacher Resistance to Television

Rather too little, I think, has been said about teacher resistance to television in the classroom. That has been, in part, because it embarrasses the sponsors and planners of ETV, and, in part, because it has not helped the image of the teacher to seem to be opposed to modern educational technology. Yet hardly anything has done more to lower the effectiveness of classroom television, to tarnish the image of ETV, and ultimately to focus attention on television as an intruder rather than as a helper. Teacher resistance, active or passive, has been very widespread. No long-term ETV project that I know has escaped it. For eight years it kept Niger ETV from reaching more than 20 classrooms and 600 students. In El Salvador it encouraged a bitter teacher strike. In Samoa it caused television to be removed entirely from high schools and to be cut back sharply from elementary classrooms.

The source of this resistance has two main components: Threat to the teacher's status and rewards, and interference with local classroom control of schedule and content.

The classroom, as all teachers know, has been an independent dominion. When that dominion is shared with another teacher—

attractive, skillful, supported by more props, more preparation time, more guests and demonstrations than any classroom teacher can possibly produce, glamorized by all the settings, lighting, and camera angles possible to television—then comparison with the classroom teacher is inevitable. Furthermore, teachers can hardly be unaware that television costs money that otherwise might go into teacher salaries. If television is *invited* into the classroom, if the classroom teacher commits himself or herself to wanting it and using it, and if it provides the kind of help the classroom teacher knows he or she needs, and is available at the time when he or she knows the class is ready for it—then the situation is more favorable. Thus, the advice has emerged from every incident of teacher resistance that teachers should be brought into the planning and allowed to help decide what kind of television they need and when they want it. This is the main conclusion of the analysis of the problem by the French publication *Direct* (1973). But it runs into a characteristic of ETV that presents a difficult problem.

This is the need to decide between the economy and quality of centralized broadcasting over a large area and the educational and psychological advantages of local control of instruction in the classroom.

No local school system can match the television quality of AIT programs. No classroom can bring its pupils the demonstrations and learning experiences possible on centrally made programs. Yet if those experiences come at the wrong time for a particular classroom (when the class is not ready for them, or has gone past them), or if they represent an approach that is uncongenial to the teacher or foreign to the experience of the pupils, then much of the quality is wasted. The teacher feels locked into a schedule not of his or her own making. Even mainland teachers in Samoa complained that the programs "kept coming" relentlessly, day after day, whether the teacher thought that time should be used for other purposes or not, whether the pupils were ready or not. If the teacher turned off the receiver for a program or two, then what happened in the classroom became less and less congruent with what was happening on the television. Of course, if television recording had been readily available, some of the schedule problems would have been alleviated. But although local recording is becoming more and more common, it is still far from widely available and represents a costly addition to school equipment and operation.

What to do? Niger faced the problem of threat to the teacher by using relatively untrained monitors rather than certified teachers in the classroom (with predictable reactions from the rest of the teacher corps) and by trying to keep teachers off the television screen. That is, television was envisaged as "shows for kids," and typically took the form of skits or demonstrations that could then be imitated or discussed in the classroom. Hagerstown, Maryland faced it by selecting teleteachers from the ranks of classroom

teachers and returning them to the classroom after a few years, and by emphasizing the subjects where trained teachers were in short supply. Samoa accomplished a great deal in the first two years of ETV by exposing its classroom teachers, for the first time, to experienced teachers teaching their own subjects to their own pupils in their own classrooms, on television. It was a traumatic experience, but also a great exercise in training. After two years the Samoan classroom teachers were different teachers; if this had been clearly realized and the classroom teachers given progressively greater responsibilities, the later outbreak of teacher resistance might have been avoided. But the television "kept coming," and the relative position of teleteacher and classroom teacher remained unchanged. And dissatisfaction grew.

What does this mean for AIT? It seems to me that AIT has already gone about as far as it can in bringing teachers or their surrogates, over a wide area, into the planning for the programs. Certainly, it has done more with this than Airborne did, and this may be all that can be done, presently, in cooperative planning of very widely circulated programs. In the future, one function of AIT may be to provide certain *components* of television instruction that can be incorporated into the televised or telerecorded teaching of state and local systems. There are undoubtedly many such segments and components—demonstrations, dramatizations, presentation of new developments, distinguished people, important events, trips to faraway places—that could never be gathered locally but would have wide generality and would contribute powerfully to local teaching without requiring the local system to use an entire open-circuit series. At least if I were planning for the future of AIT I would let my imagination run along that road.

But there is another possibility that requires no such change in policy: don't make available *too much* television, and make sure it is something that the classroom teacher knows he or she *could not provide*. Ten years ago I watched a great many programs supervised by an interschool committee, broadcast and tried in California schools. Even when the subject was something relatively new to many teachers (like the "new" math), the classroom teachers soon began to wonder whether *they* could not do as well as the teleteacher; and when the subject matter was less new, more and more sets were turned off, and fewer and fewer schools renewed their subscription. AIT's affective series (*Inside/Out, Self Incorporated,* etc.) illustrated classroom material that could never have been produced half so well locally, that teachers recognized the need of, and—note well—that in effect became the property of the classroom teacher because *he* or *she* could conduct the discussion afterward and apply the lessons of the television story to the needs and experience of his or her own students. It seems to me, therefore, that in planning the new series the question should always be this: What learning experience can be put into the series that the local teacher could not provide, and *knows* he or she could not provide,

and that can be used actively by the local teacher, just as a chart is, or a film or a reading assignment?

If I were planning for AIT I should also try to keep from producing *too much* in the new series. What is the *unique* thing television can contribute? Perhaps the program time is not so sacred as we have made it. Perhaps ten minutes instead of twenty would sometimes be appreciated, if they were top-notch minutes. The class bell and the 50-minute lecture have imposed an entirely artificial limit on good teaching, just as the television schedule has. If television could move to break that pattern, if it could try to leave its viewers a little hungry rather than a little impatient, it might be more effective and more appreciated.

3. Attention

We know that *span* of attention increases from first exposure through the early school years and usually into the teens; that *depth* of attention decreases after the preschool years when the child's cognitive field is still relatively empty; and that *undivided* attention becomes increasingly less common after early childhood.

The last of these, especially, has been studied more carefully in recent years, and the result has been to overthrow a number of old stereotypes about viewers being glued to the television set, lost to the outside world while the story goes on, and so forth. Camera studies of television viewers have shown that even young children frequently look away from the screen, play for a little while with toys on their laps, and watch each other for nonverbal messages. When families are photographed in front of their television sets the division of attention is marked: they talk, leave and return, iron the clothes, look at a newspaper, scold the children, and do other such things. In the case of the male head of the family, a remarkable degree of attention seems to be achieved when he is watching professional football, but even here the male animal relaxes during commercials (doubtless turning off the message), goes out for a beer, discusses important plays, or cusses out the referee.

A study at the University of Chicago obtained candid accounts from students of their mental lives during class lectures they had just completed. These accounts were remarkably similar. There was little attention to the introductory sentences, then a brief period of attention while the lecturer launched into his principal message. After that, some particular statement would set the student thinking, and he would mentally wander far away from the lecture (while still monitoring it at a low level of attention), returning to it every few minutes in response to some emphasis or a summary statement by the teacher, then wandering away again. Not infrequently, something in the classroom—a pretty girl, a student sending out signals of disagreement or starting to fall asleep—would draw attention away from the lecture. But always attention would return, as the

student tuned himself in and out, in and out, through the magic fifty minutes of the college period.

There seems to be good reason to believe that attention, on the average, is higher for television or film teaching than for ordinary lecturing, but the pattern is the same, and the more that television duplicates the lecture the more the results correspond. Obviously, this must not be the most efficient possible use of teaching time, and it challenges television producers as well as university lecturers to use the time better.

What can we do about it, beyond simply making the material we present as interesting as possible? Four general strategies have seemed to prove useful.

The most common is a *change of pace*. We know that a change from verbal to pictorial presentation in a classroom almost always heightens interest, as does a change in a film or television program from explication to observation. Music is a time-honored device to call viewers back from their daydreams and signal that something new is about to be presented. An experienced public speaker, or an experienced popular writer, will interrupt his commentary every minute or two for an example or a story. Humor will relax an audience and prepare it for the demands of more learning. Any producer knows how to use his visual track to provide variety. And yet there is a limit to how often and how much the pace can be changed. An interesting Swedish study has shown that the use of humor, music, and attention-attracting visual changes can, over time, just as easily reduce the amount of learning as increase it, and American studies also have shown that the *relevancy* of these devices to the subject matter determines whether they increase the learning. Any speaker tries to use his stories and examples, not simply for relaxation, but to emphasize the points he is making. The ETV producer must do the same.

Another strategy is the use of short segments. One of the chief reasons that *Sesame Street* achieves its high level of viewer attention is its division into short segments, swiftly paced, so that a child is encouraged to stay with the program for the few minutes of a segment, relax briefly before the next segment, and come back as an active viewer, knowing that he will not have to endure a long and unvaried piece of teaching. The variation of characters, animation and live action, puppets and live actors, songs and dialogue, is also very skillfully managed on *Sesame Street*. The brassy, staccato pace of that program would not be appropriate for many in-school programs, but it has raised the question—now heard so often—of the length of ETV programs and the division of time within them.

Consciously or unconsciously, as we have already suggested, a great deal of ETV has been modeled on the classroom lecture. Most of the "talking face" programs have been. And even though televi-

sion can present incomparably more effective lectures than we are accustomed to hearing in classrooms, I venture to predict that most AIT producers would not consider this to be, either in content or in timing, the best use of television. Typically, the most effective study programs have avoided it. The Italian Telescuola study group programs, usually fifteen minutes long, began with a bit of review and then had a comedy scene making the point of the day's lesson; finally there was discussion of what the comedians had illustrated, and this led to group practice. Niger in-school programs, ten to twenty minutes long, tended to be dramatic skits, often in broad comedy. AIT's affective programs were mostly dramas, and quite short dramas because the aim of it all was to set the stage for discussion in the classroom. The best of NHK (Japan National Broadcasting Corporation) programs have presented quite sophisticated ideas in a succession of examples—a classroom scene, an animated sequence, a brief interview, a look at Japanese village life, and so forth. This, rather than the illustrated lecture, comes close to the special genius of television. And who is to say that a teaching program need be fifty minutes long because a class period is, or thirty minutes long because that fits the station schedule; or that it should not be broken into concise and attention-holding segments because a classroom teacher does not usually fill the class period that way? Someone is going to make a healthful sensation by occasionally sending out a tightly-made five- or ten-minute program for a twenty- or thirty-minute broadcast period, and repeating the program later if the teacher needs or wants it.

A third strategy is simply the emphasis on *action*, rather than talk, and the design of programs leading to later action. We have been talking about successful programs that are in large part shows rather than lectures, and thus bid for attention in the same way that commercial television has found so effective. But another way of building ETV around action is to design a program that the viewer knows will help prepare him for some *later* action. The students who watched the child-actors in *Inside/Out* deciding whether to take a dare knew that *they* were going to have to consider that same question when the program was over. One reason for the strength of the rural forum programs in a dozen countries was that the viewers knew they themselves, in the following discussion period, were going to have to decide upon the ideas presented in the program. The fundamental literacy programs of Acción Cultural Popular (ACPO) in Colombia are attended to closely because they become the subject matter of group practice as soon as the program ends. Thus, just as children listen very carefully when they are being given directions and clues for a "treasure hunt" that is about to begin, so are viewers who know the program will help them take part in a discussion, or carry out a field assignment, or write a paper, or apply the content to solving a problem, more likely to sit on the edge of their seats and try to extract the essential information.

This is one of the most general propositions emerging from devel-

oping theory in this field: that an active viewer is an attentive and a learning viewer; and that viewers can either be activated because they identify with and thus "take part in" action on the screen, or because they are consciously using the program to prepare themselves for later action. AIT seemed to accomplish this with affective programs; can it do this also with cognitive learning?

Finally, there is a strategy of attention-directing and controlling cues. All media use such devices. Newspapers use big type. Books use arrows and typographical boxes. Radio uses pauses, emphasis, and repetition ("That telephone number, again, is 302-1446; once more, 302-1446!"). But television has an unequalled battery of resources with which to direct attention: zooming in on the key element in a picture, showing an action in slow motion, "instant replay," using the voice tract to tell a viewer where to look, and so forth. Any producer knows how to use devices like these.

And these are very important because of the density of the information television carries. In one way, this is the medium's strength, for there is something for everyone: learners at different levels are likely to find *something* to learn. On the other hand it presents a problem because the pictorial part of the medium offers so many alternative paths to a viewer. A television program carries much more information than a viewer can possibly attend to and remember. In one experiment (Allander, 1974), viewers were shown a brief picture of people coming into a room, conversing, and then leaving. As the viewers watched, an eye camera recorded *where* they were looking. When they were not given any directions, there was a great variety in eye patterns. However, when they were asked specific questions—for example, what kind of clothes are these women wearing? how do these people seem to be related? what can you tell about why they are here? what would you judge are their ages and occupations?—for each question there was a typical pattern of eye movements. In other words, viewers would look for the kind of information they were told to look for, and might not see unless directed to it. And this is undoubtedly what happens with ETV. If we want students to use their viewing time most efficiently—or at least to learn what we intend for them to learn—we had better use the unequalled power of television to direct them through the unequalled variety of television.

4. The Codes of Television

This is the richest of all the developing areas of media theory, and yet we know relatively so little about it that its implications are far from clear. However, the basic concepts are clear enough. Most teaching and learning are essentially information processing. Information can be received from different kinds of experience—participation, observation, and exposure to teaching directly or through media—but it has to be processed, interpreted, stored, and retrieved in the form of symbol systems or codes. There are three general types of codes, to which we give names borrowed from the theory of

signs and from computers: digital (of which the chief examples are words and numbers), iconic (television, film, still pictures), and analogue (music and sound). The media are not pure examples of different codes, but different ones emphasize different codes. Print is almost wholly digital; radio is a combination of digital (words) and analogue (music and the sound components of speech); television and sound film can make use of all three codes, but their chief distinctiveness is their ability to present iconic information.

These codes are processed very differently. Verbal (digital) information is received through symbols whose relation to human behavior is learned early in life (perhaps the human animal's greatest intellectual accomplishment) and that are added to, in terms of printed symbols, throughout the school years. These symbols are highly abstracted. They have to be received linearly, although life is not essentially linear. They represent a highly efficient way of transporting a great quantity of information across space and time, although relating this information back to life—giving it meaning—requires a further step. Consequently, the meaning of verbal information depends on the experience that an individual has had and to which he has learned to relate the symbols.

A child learns to receive iconic information earlier than digital. It is not received linearly, but rather simultaneously: all the information is in front of one, and it is not necessary to wait for the end of the sentence. Its meaning also depends on one's experience, but it is not abstracted from life; it *is* life, although a selected view of it. It is not efficient in the way that verbal information is, in carrying large amounts of information quickly between persons who know the same codes; its efficiency is rather in the depth and richness of its information. Thus the verbal code can tell us that a person is happy or an action is dangerous. The iconic code can give us a subtler definition of happiness or danger.

Analogue information is closer to the iconic than to the digital code, but it is seldom representational (except as a flourish of trumpets, a siren, or the Bridal Chorus from Wagner's *Lohengrin* acquire specific meaning in certain cultures). More often it communicates emotion. (A public speech, for example, has greater impact when it is heard than when it is read.)

Digital information is apparently processed largely in the left hemisphere of the brain, iconic and analogue information in the right hemisphere. If we understood this process fully, we would understand more than we do about learning from the media. If we understood fully how these three kinds of coded information are stored in the brain, we would be in still better position to improve teaching and learning. It is clear that all the codes do enter into the storage of information, and that they interact and stimulate one another. For example, we respond to the signal "chair," which we read on the page of a book in a digital code, but this must be stored away with

what is left from all our experience with chairs or pictures of chairs—the concept of "chairness." Iconic experience gives us a picture of one chair, and we store a different piece of information from every simple iconic experience. How all this is put together and related we do not yet fully understand.

We can understand, though, that a typical school room is mostly verbal. Most teaching is in the linear code; almost all tests are. For a number of centuries we have devoted most of our instruction to print and writing that are highly abstracted from life, and very little instruction to the iconic code that is selective but not abstracted. Therefore, we have subordinated a large area of human experience, and neglected the development of one hemisphere of the brain while working very hard to develop the other hemisphere.

It is predictable that a number of insights are going to emerge in the next decades that will help us to understand these differences in information processing and to use the iconic media more efficiently. At present we are caught between an incomplete theory and the present state of practical pedagogy.

A few papers, however, have tried to express the emerging theory in terms of instruction. In a 1974 article, Salomon, an Israeli educational psychologist, offered this proposition for teachers: "The better a symbol system conveys the *critical features* of an idea or event, the more appropriate it is" for an act of instruction. "If the simultaneous operation of valves in an engine is taken as the critical feature, language would not be an appropriate medium to convey that sort of information . . . if the knowledge to be extracted is supposed to be a mental representation of a simultaneously occurring set of events, a linear message would require additional re-encoding on the learner's part" (p. 392). "Thus when one is to teach about the relationship between waterways and urban development in Europe, maps and graphs will probably be used because this is the unique content-knowledge they specify. Similarly, when one is to teach how an internal combustion engine works, a slow-motion film may be used because it will focus on the simultaneously occurring operations; film is used here because its coding system is better suited to handle this type of information" (p. 400).

Salomon is advising, then, that the critical features of what is to be taught and learned will be crucial in determining whether television is the medium to be used for that purpose. What code comes closest to what is to be learned? For example, let us return to what we have recently said about concept learning. If the concept to be learned is "chair," then it is necessary for the learner to see enough representations of chairs that he becomes able to detect the common features of them and to abstract the idea of "chairness." The coding system of television, or another visual medium, would be appropriate for that objective. On the other hand, suppose that the concept is "eternity." It is better learned by relating the new term through language to other concepts already learned. Bruner and

Olson (1973) give another example of the limitations and strengths of different media. A verbal rule (digital code) such as "Keep your weight on the downhill ski" is clearly strengthened by seeing a model (iconic code) of good and bad ski performance, on film or television. But the lesson is probably never comprehended until one has had his first fall. Then one says, while wiping the snow off his face, "*That's* what he meant!" (p. 226). Thus the search for the necessary features of the learning task are likely to lead beyond one medium to a combination of media, and in many cases to direct experience.

Let me say again that we may expect important and useful developments in this area of theory within the next decade or so. At present, however, its chief practical message to the producer is that he should look for the critical features of what is to be learned, and in what code or codes they are best presented; and then decide whether television has a significant part in this particular task, and if so how it may best be used.

We shall return to the codes of television in section 6 of this paper.

5. The Concreteness of Television

Over the last decade the most extensive efforts to develop a pedagogy for media teaching have been made by Robert Gagné, Leslie Briggs, and some of their associates. These contributions have included Gagné's notable book, *The Conditions of Learning* (1965, new edition, 1977), Gagné and Briggs's *Principles of Instructional Design* (1974). A few years ago I spent several days with Gagné, in Hawaii, talking about what television could contribute to the five great areas of learning as he has defined them—verbal knowledge, intellectual skills, motor skills, cognitive strategies, and attitudes and values. I have no wish to quote Dr. Gagné on anything that he has not published, and in any case he should not be held solely responsible for the conclusions we came to, although we used his framework of areas of learning, kinds of learning, events of instruction, and so forth. However, I think it is not betraying a confidence to set down what I remember as the chief contributions he felt television could make to each of the five areas.

In verbal knowledge, Dr. Gagné feels that the most significant contribution of ETV may be to provide a *meaningful context* so that new names and definitions can be retained and used. McLuhan said that you can tell someone what a bucket is, but he will never really understand until he sees a bucket or a picture of it.

In learning intellectual skills, he feels that television can be especially helpful in recalling the necessary rules and concepts and the procedures for applying them. In other words, the process can be illustrated and the necessary discriminations set forth concretely.

In motor skills, television can be very useful in recalling the neces-

sary physical or motor routine. For example, one can hardly learn to throw a curve with a baseball solely from watching a television picture of someone throwing a curve, but the picture can illustrate the routine and thus make it easier to learn and recall the kinesic procedures that must be mastered by actual practice. A few years ago, an elementary school class was allowed to watch a film of a player shooting free throws with a basketball. None of the students had ever practiced that skill, but when they were taken to the basketball court they performed significantly better than other classes of the same age that had not been shown the film.

In learning cognitive strategies, such as problem solving, Gagné feels that television can be substantially useful in recalling the rules and concepts that enter into the strategy, and helping the learner transfer the strategy to new situations by showing concrete examples of its application. This is particularly important in extending and applying new learning.

Finally, he feels that television can contribute significantly to the learning of values and attitudes by presenting situations where one behavior must be chosen rather than another, and by presenting models of the desired behavior that can be admired or identified with.

Looking back over this inadequate summary of three days of talk, one sees a common thread in all these uses. It is the *concreteness* of the medium. Television can provide a concrete and meaningful context against which to learn names, definitions, other verbal knowledge. It can provide concrete reminders of the components of intellectual skills. It can provide concrete illustrations of the kinesic routines involved in motor skills. It can provide concrete illustrations of how cognitive strategies can be applied to new problems and new situations. And it can provide concrete examples of situations of choice that put flesh and blood on the abstractness of values and attitudes.

Thus, in this area of middle-range theory, we are at the point where the concreteness of television stands out as perhaps its chief contribution to instruction, and the challenge to the producer is therefore to ask where his kind of concreteness is needed (as opposed to the abstractness of words and numbers) and where it can best be presented through the codes of television rather than direct observation or practice.

6. Unintended or Indirect Effects of Television

Ever since we have had research on radio and television, we have been finding out how many of their effects are indirect or unexpected. Thirty years ago we found that radio soap operas were being used by female listeners, not merely for pleasure and diversion, but as a sort of Ann Landers—a guide to solving personal problems and making personal decisions. In the early 1950's we learned with

some interest that a propaganda film intended to show that American workers were being ground under the iron heel of capitalism had succeeded, in certain Eastern European countries, at least in teaching that the oppressed American workers wore expensive and well-made shoes. And studies of children's television have reported over and over again that children are learning from supposedly entertainment programs a great variety of lessons about the world they live in and how to behave in it. That is, they are not merely diverted, relaxed, excited, or titillated by the program; they are also learning what kind of behavior will be expected of them as they grow into the teen years and the years of adulthood, how to treat boys (or girls), how to make love, what kind of behavior is admired, what different life-roles are like (policemen, businessmen, politicians, gamblers, taxicab drivers, and so forth), who has power in their society, who is important enough to go on television, and so forth. This has led to a certain amount of concern over the imbalance of television's view of the world, the presentation of violence as a kind of behavior that works or is rewarded, and the kinds of values that are shown as admirable in adult society.

The producer of instructional television also must be aware that his programs are likely to teach values, behavior, and knowledge of the surrounding world beyond and often quite apart from the learning that is to be tested in the classroom. This is particularly important when the program is in dramatic form, or lets the students observe scenes "out of life."

But we sometimes forget that knowledge and values are not the only learning outcomes of television. Viewers also learn *skills*. Sometimes these are intended—as in the examples we gave of learning motor skills (shooting a basketball, throwing a curve with a baseball, or skiing) from observing those skills on film or television. Very often, however, the skills are unintended or unexpected. Let me give an example from some research on television in which I participated in El Salvador.

This was a five-year project, during which we had the opportunity to watch three cohorts of students move through the three-year middle school, which was then being introduced to instructional television. We had the opportunity to set up experimental and control groups to compare the effects of television against effects of the same curriculum and similar teaching *without* television, and we were able to study many thousands of students, so that the results invited confidence. In general, the comparison of cognitive learning between experimental and control groups was not as definitive as we had expected. The television groups did better overall, but sometimes the experimental groups did better, sometimes the control groups, and the differences were not impressive. However, there was one difference that *was* impressive. We gave general ability tests at the beginning and end of each school year. In contrast to the slight differences in cognitive gain, the television groups gained

steadily in general ability throughout their time in school, and significantly more than the non-television groups. When we examined this result more closely, it became apparent that most of the difference was in their performance on the non-verbal parts of the test—that is, the parts that used drawings to test analogies and diagrams to illustrate process, and the like. We concluded that even though the television students were not learning much more *verbal* cognitive information, they were learning the skills of processing *iconic* information. They were learning *skills* that probably would not have been tested if we had not given the general ability tests.

Let me hasten to say that we found also other indirect effects of television on the school system and the classroom that were considered important (see Mayo, et al. 1976). But the finding about iconic skill learning should be of the greatest interest to ETV producers.

In their notable 1973 article, Bruner and Olson argued that teaching by media is important not only for the knowledge that is taught, but also because "the medium of instruction, the form of experience from which the knowledge is gleaned, has important consequences on the kinds of intellectual skills children develop" (p. 226). The experience of kicking a ball, he points out, teaches children not only something about the ball, but also about the act of kicking. The experience of looking at a face from various angles teaches one to see a picture of one angle of a face as the representation of a whole face (or cows seen in profile as whole cows, even though only two legs are visible). The experience of picking out the important details in a picture teaches them to pick out such details more quickly. In other words, learning from television teaches children to learn from television.

That brings us back to the coding systems about which we talked in section 4. We remarked that school has always been a verbal place. The lion's share of the skill learning that goes on there is in handling the digital codes of verbal and numerical languages. Intelligence has often been called "skill in a medium." For the most part that medium has been print and the spoken word. Progress in school has been measured largely in terms of cognitive knowledge and digital codes of information. College entrance examinations have dealt almost exclusively with those domains of knowledge and those skills. Should we not reconsider whether the iconic codes, and the skills of processing iconic information, are not worth more attention than they have received?

As we have said, the experience of learning from television teaches children to learn more efficiently from television. The experience of reading and understanding spoken language teaches a child to learn more efficiently from such verbal codes. But we devote an enormous amount of effort to helping the child master the digital codes. Would not a certain amount of help also contribute usefully to the skills of learning from iconic codes?

A group of experiments, mostly done in or around 1970, determined that students could be *helped* to learn from visual observation. When students saw pictures that "zoomed in" on details, they learned to look for such details and were able to deal more easily with visual complexities. When they saw films that "spread out" the details of complex visual displays, they learned to handle such complexities without special help. When *Sesame Street* came to Israel, Salomon (1972) was able to study a group of children who had previously had little experience with television. He found that the experience of viewing made them noticeably more adept at extracting the essential information from film or television. He suggested that some systematic help might speed up the learning of such skills.

This is a question that a producer might well consider. The more skills his students acquire in learning from television, the more he can teach them, and the more freedom he will have in using television in its best ways to teach. Furthermore, the best time for this is early in their experience with visual skill learning. AIT's new series will be in the early school grades: how and to what extent can it be used, not merely for the cognitive goals that have been specified, but also for improving the skills of learning from the medium?

The El Salvador studies showed that improving skills in processing iconic material could contribute to "general ability." If intelligence is really "skill in a medium," then whatever we can do through television experience to contribute to skill in processing information in the iconic code takes on a new importance. Whenever one acquires skill in a new coding system, one becomes able to think in a new way, handle more kinds of information, use new mental tools to analyze experience—in other words, increase one's mental capacities. This is what happens when one learns to read and write and figure. Does it not happen also when a child learns to deal more efficiently with the world of iconic experience? If instructional television can be used to develop skills in the use of its own code, can it not contribute to the development of a kind of intelligence heretofore largely neglected in school?

7. The Need of Formative Research

I am afraid the preceding pages have proved that whereas one can derive stimulating *general* ideas from theoretical research on television, when a producer wants to translate these into *specific* guidance he must rely either on his own creative instincts or on formative research. And without in the least undervaluing the value of creativity, I would like to say that I have very seldom seen an activity that has a greater need than ETV for formative research.

Consider the situation. Instructional television, as represented by AIT, requires a large initial investment before programs go into the schools. It must serve a variety of situations and needs. Feedback comes slowly—nothing like what happens in a classroom, where a teacher can watch the students' faces and ask questions and revise

procedures accordingly. It is too expensive to do an unsuccessful series over, and if that becomes necessary the subscribers are probably lost anyway. Furthermore, the only way that a producer of ETV can evaluate his own production instincts is to try them out on the sort of students he wants to teach. The only way he can decide between production alternatives that seem equally attractive is to try them out. Therefore, an ongoing capability to test programs or segments of programs or alternative forms of programming, and get quick results before large amounts of money are committed—a capability of that kind to conduct formative research while production is beginning—will not only make better programs but better producers.

I said early in this paper that the shortfall of theoretical research will make formative research all the more essential to ETV. In conclusion, I should like to underline that.

Now, of course, there are different ways to conduct formative research, and some are better than others. But that is another topic.

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